

# ASSIGNMENT 1

Textbook assignment: "Introduction to Generators and Motors," pages 1-1 through 4-18.

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- 1-1. In generators, what principle is used to convert mechanical motion to electrical energy?
  1. Atomic reaction
  2. Electrical attraction
  3. Magnetic repulsion
  4. Magnetic induction
- 1-2. When you use the left-hand rule for generators, what is indicated by the middle finger?
  1. Direction of flux
  2. Direction of motion
  3. Direction of current flow
  4. Direction of the magnetic field
- 1-3. The output voltage of an elementary generator is coupled from the armature to the brushes by what devices?
  1. Slip rings
  2. Interpoles
  3. Terminals
  4. Pigtales
- 1-4. An elementary generator consists of a single coil rotating in a magnetic field. Why is NO voltage induced in the coil as it passes through the neutral plane?
  1. Flux lines are too dense
  2. Flux lines are not being cut
  3. Flux lines are not present
  4. Flux lines are being cut in the wrong direction
- 1-5. What components cause(s) a generator to produce a dc voltage instead of an ac voltage at its output?
  1. The brushes
  2. The armature
  3. The slip rings
  4. The commutator
- 1-6. When two adjacent segments of the commutator on a single-loop dc generator come in contact with the brush at the same time, which of the following conditions will occur?
  1. The output voltage will be zero
  2. The output voltage will be maximum negative
  3. The output voltage will be maximum positive
- 1-7. In an elementary, single-coil, dc generator with one pair of poles, what is the maximum number of pulsations produced in one revolution?
  1. One
  2. Two
  3. Three
  4. Four
- 1-8. If an elementary dc generator has a two-coil armature and four field poles, what is the total number of segments required in the commutator?
  1. 8
  2. 2
  3. 16
  4. 4

- 1-9. How can you vary the strength of the magnetic field in a dc generator?
  1. By varying the armature current
  2. By varying the speed of armature rotation
  3. By varying the voltage applied to the electromagnetic field coils
  4. By varying the polarity of the field poles
- 1-10. Under which of the following conditions does sparking occur between the brushes and the commutator?
  1. When operating under normal conditions
  2. When there is improper commutation
  3. When there is an excessive load current
  4. When commutation is in the neutral plane
- 1-11. Distortion of the main field by interaction with the armature field defines what term?
  1. Commutation
  2. Mutual reaction
  3. Armature reaction
  4. Mutual induction
- 1-12. Distortion of the main field by interaction with the armature field can be compensated for by the use of
  1. slip rings
  2. interpoles
  3. a commutator
  4. special brushes
- 1-13. Motor reaction in a dc generator is a physical force caused by the magnetic interaction between the armature and the field. What effect, if any, does this force have on the operation of the generator?
  1. It tends to oppose the rotation of the armature
  2. It tends to aid the rotation of the armature
  3. It causes the generator to vibrate
  4. None
- 1-14. In dc generators, copper losses are caused by which of the following factors?
  1. Reluctance in the field poles
  2. Resistance in the armature winding
  3. Reactance in the armature and field windings
  4. All of the above
- 1-15. Eddy currents in armature cores are kept low by which of the following actions?
  1. Using powdered iron as a core material
  2. Limiting armature current
  3. Insulating the core
  4. Laminating the iron in the core
- 1-16. What makes the drum-type armature more efficient than the Gramme-ring armature?
  1. The drum-type armature has more windings than the Gramme-ring armature
  2. The drum-type armature can be rotated faster than the Gramme-ring armature
  3. The drum-type armature coils are fully exposed to the magnetic field, while the Gramme-ring armature coils are only partially exposed to the magnetic field
  4. The drum-type armature has a laminated core, while the Gramme-ring armature has a solid core

- 1-17. What type of dc generator application best utilizes the features of the lap-wound armature?
1. High-voltage
  2. High-current
  3. High-speed
  4. Variable-speed
- 1-18. Which of the following is NOT a major classification of dc generators?
1. Compound-wound
  2. Series-wound
  3. Shunt-wound
  4. Lap-wound
- 1-19. What characteristic of series-wound generators makes them unsuitable for most applications?
1. They require external field excitation
  2. The output voltage varies as the speed varies
  3. They are not capable of supplying heavy loads
  4. The output voltage varies as the load current varies
- 1-20. As the load current of a dc generator varies from no-load to full-load, the variation in output voltage is expressed as a percent of the full-load voltage. What term applies to this expression?
1. Gain
  2. Voltage control
  3. Voltage regulation
  4. Load limit
- 1-21. When two or more generators are used to supply a common load, what term is applied to this method of operation?
1. Series
  2. Compound
  3. Split-load
  4. Parallel
- 1-22. What special-purpose dc generator is used as a high-gain power amplifier?
1. Lap-wound
  2. Shunt-wound
  3. Amplidyne
  4. Compound-connected
- 1-23. The gain of an amplifying device can be determined by which of the following formulas?
1.  $GAIN = INPUT + OUTPUT$
  2.  $GAIN = INPUT \times OUTPUT$
  3.  $GAIN = OUTPUT - INPUT$
  4.  $GAIN = OUTPUT \div INPUT$
- 1-24. The maximum gain possible from an amplidyne is approximately
1. 100
  2. 5,000
  3. 10,000
  4. 50,000
- 1-25. What determines the direction of rotation of a dc motor?
1. The type of armature
  2. The method of excitation
  3. The number of armature coils
  4. The polarity of armature current and direction of magnetic flux
- 1-26. When you use the right-hand rule for motors, what quantity is indicated by the extended forefinger?
1. Direction of flux north to south
  2. Direction of flux south to north
  3. Direction of current
  4. Direction of motion

- 1-27. Which, if any, of the following situations is a major electrical difference between a dc motor and a dc generator?
1. The armatures are different
  2. The shunt connections are different
  3. The dc generator requires a commutator, the dc motor does not
  4. None of the above
- 1-28. In a dc motor, what causes counter emf?
1. Improper commutation
  2. Armature reaction
  3. Generator action
  4. Excessive speed
- 1-29. In a dc motor, how, if at all, does counter emf affect speed?
1. It causes the speed to increase
  2. It causes the speed to decrease
  3. It causes rapid fluctuations of the speed
  4. It does not affect speed
- 1-30. What is the load on a dc motor?
1. The field current
  2. The armature current
  3. The mechanical device the motor moves
  4. The total current drawn from the source
- 1-31. When a series dc motor is operated without a load, which of the following conditions occurs?
1. The armature draws excessive current
  2. The voltage requirement increases
  3. The armature will not turn
  4. The armature speeds out of control
- 1-32. A dc series motor is best suited for which of the following applications?
1. Steady load, low torque
  2. Variable load, low torque
  3. Steady load, high torque
  4. Variable load, high torque
- 1-33. What is the main advantage of a shunt motor over a series motor?
1. A shunt motor develops higher torque at lower speeds than a series motor
  2. A shunt motor can be operated at higher speeds than a series motor
  3. A shunt motor draws less current from the source than a series motor
  4. A shunt motor maintains a more constant speed under varying load conditions than a series motor
- 1-34. How can the direction of rotation be changed in a dc motor?
1. Only by reversing the field connections
  2. Only by reversing the armature connections
  3. By reversing both the armature connections and the field connections
  4. 4.By reversing either the armature connections or the field connections
- 1-35. When the voltage applied to the armature of a dc shunt motor is decreased, what happens to the motor speed?
1. It becomes uncontrollable
  2. It decreases
  3. It increases
  4. The motor stops
- 1-36. In a dc motor, the neutral plane shifts in what direction as the result of armature reaction?
1. Clockwise
  2. Counterclockwise
  3. In the direction of rotation
  4. Opposite the direction of rotation

1-37. The current in the interpoles of a dc motor is the same as the

1. armature current
2. field current
3. total load current
4. eddy current

1-38. In a dc motor, what is the purpose of the resistor placed in series with the armature?

1. To counteract armature reaction
2. To limit armature current
3. To increase field strength
4. To prevent overspeeding

1-39. Magnetic induction in an alternator is a result of relative motion between what two elements?

1. The rotor and the armature
2. The armature and the field
3. The field and the stator
4. The rotor and the field

1-40. Voltage is induced in what part of an alternator?

1. The commutator
2. The brushes
3. The armature
4. The field

1-41. What are the two basic types of alternators?

1. Multiphase and polyphase
2. Alternating current and direct current
3. Rotating field and rotating armature
4. Series-wound and shunt-wound

1-42. Which of the following alternator types is most widely used?

1. Shunt-wound
2. Rotating-armature
3. Series-wound
4. Rotating-field

1-43. The purpose of the exciter in an alternator is to

1. provide dc field excitation
2. compensate for armature losses
3. compensate for counter emf
4. counteract armature reaction

1-44. An alternator using a gas turbine as a prime mover should have what type of rotor?

1. Turbine-driven
2. Salient-pole
3. Armature
4. Geared

1-45. In alternators with low-speed prime movers, only what type of rotor may be used?

1. Geared
2. Armature
3. Salient-pole
4. Turbine-driven

1-46. Alternators are rated using which of the following terms?

1. Volts
2. Watts
3. Amperes
4. Volt-amperes

1-47. What does the term single-phase mean relative to single-phase alternators?

1. All output voltages are in phase with each other
2. The voltage and current are in phase
3. The phase angle is constant
4. Only one voltage is produced

1-48. In a single-phase alternator with multiple armature windings, how must the windings be connected?

1. Series
2. Parallel
3. Wye
4. Delta

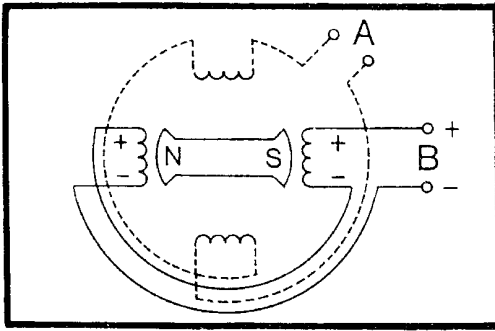


Figure 1A.—Two-phase alternator.

IN ANSWERING QUESTION 1-49, REFER TO FIGURE 1A.

- 1-49. What is the phase relationship between voltages A and B?
1. In phase
  2.  $45^\circ$  out of phase
  3.  $90^\circ$  out of phase
  4.  $180^\circ$  out of phase
- 1-50. A two-phase, three-wire alternator has what maximum number of output voltages available?
1. One
  2. Two
  3. Three
  4. Four

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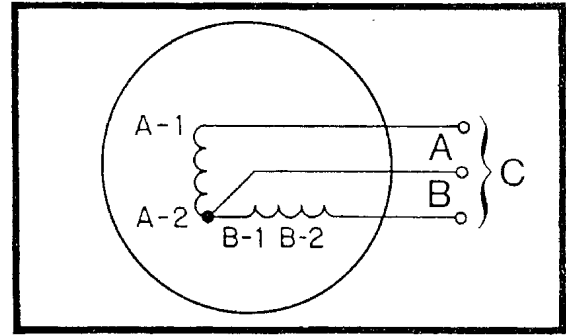


Figure 1B.—Connections for two-phase, three-wire alternator output.

IN ANSWERING QUESTION 1-51, REFER TO FIGURE 1B.

- 1-51. What is the relative amplitude of the voltage at output C as compared to A and B?
1. C is .707 times A or B
  2. C is equal to the difference between A and B
  3. C is 1.414 times A or B
  4. C is twice the sum of A and B
- 1-52. What determines the phase relationship between the individual output voltages in a multiphase alternator?
1. The speed of rotation
  2. The number of field poles
  3. The method of connecting the terminals
  4. The placement of the armature coils
- 1-53. What is the phase relationship between the output voltages of a three-phase alternator?
1. In phase
  2.  $60^\circ$  out of phase
  3.  $90^\circ$  out of phase
  4.  $120^\circ$  out of phase

- 1-54. The ac power aboard ship is usually distributed as what voltage?
1. 115-volt, three-phase
  2. 115-volt, single-phase
  3. 230-volt, single-phase
  4. 450-volt, three-phase
- 1-55. The output frequency of an alternator is determined by what two factors?
1. The number of poles and the number of phases
  2. The number of poles and the speed of rotation
  3. The speed of rotation and the volt-ampere rating
  4. The number of phases and the volt-ampere rating
- 1-56. A four-pole, single-phase alternator rotating at 18M rpm will produce what output frequency?
1. 60 Hz
  2. 400 Hz
  3. 1800 Hz
  4. 3600 Hz
- 1-57. Which of the following is the correct formula for determining the percent of regulation of an alternator?
1.  $\frac{E_{NL} - E_{FL}}{E_{FL}} \times 100 = \%$
  2.  $\frac{E_{NL} \times E_{FL}}{100} = \%$
  3.  $E_{NL} - E_{FL} \times 100 = \%$
  4.  $\frac{E_{NL}}{100} \times E_{FL} = \%$
- 1-58. In most alternators, the output voltage is controlled by adjusting the
1. rotor speed
  2. field voltage
  3. armature resistance
  4. electric load
- 1-59. When alternators are to be operated in parallel, which of the following alternator characteristics must be considered?
1. Voltage
  2. Frequency
  3. Phase relationship
  4. All the above
- 1-60. Which of the following motors is/are types of ac motor?
1. Series
  2. Synchronous
  3. Induction
  4. All of the above
- 1-61. Which of the following types of motors is widely used to power small appliances?
1. Universal
  2. Synchronous
  3. Polyphase
  4. Compound
- 1-62. A universal motor is a special type of
1. synchronous motor
  2. series motor
  3. parallel motor
  4. polyphase motor
- 1-63. The number of pole pairs required to establish a rotating magnetic field in a multiphase motor stator is determined by which of the following factors?
1. The magnitude of the voltage
  2. The magnitude of the current
  3. The number of phases
  4. The size of the motor

1-64. In a two-phase motor stator, what is the angular displacement between the field poles?

1. 0°
2. 90°
3. 180°
4. 360°

1-65. Adjacent phase windings of a 3-phase motor stator are what total number of degrees apart?

1. 30°
2. 90°
3. 120°
4. 180°

1-66. Which of the following types of motors has a constant speed from no load to full load?

1. Series
2. Synchronous
3. Induction
4. Universal

1-67. What type of ac motor is the simplest and least expensive to manufacture?

1. Induction
2. Series
3. Synchronous
4. Two-phase

1-68. What term applies to the difference between the speed of the rotating stator field and the rotor speed?

1. Slip
2. Synchronous
3. Rotor error
4. Torque

1-69. The speed of the rotor of an induction motor depends upon which of the following factors?

1. The method of connecting the load
2. The dc voltage applied to the rotor
3. The torque requirements of the load
4. The current in the rotor

1-70. What type of ac motor is most widely used?

1. Series
2. Universal
3. Synchronous
4. Single-phase induction

1-71. What type of ac motor uses a combination of inductance and capacitance to apply out-of-phase currents to the start windings?

1. Three-phase
2. Series
3. Synchronous
4. Split-phase induction

1-72. Why are shaded-pole motors built only in small sizes?

1. They have weak starting torque
2. They are expensive in large sizes
3. They are unidirectional
4. They require large starting current